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REPORT NO 55B 636-1
DATE 11 July 1961
NO OF PAGES 202

CONVAIR ASTRONAUTICS

CONVAIR DIVISION OF GENERAL DYNAMICS CORPORATION

CENTAUR SUBSYSTEM NO. 2

TELEPAK ASSEMBLY

FLIGHT CERTIFICATION TEST

REPORT NUMBER 55B 636-1

This document is subject to special export controls and each transmittal to foreign governments or foreign nationals may be made only with prior approval of: Hq. SAMSO, L.A., Ca. 90045 Attn: SMSD

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APPROVED BY W. G. Berry, Test Lab Group Engr.

APPROVED BY R. S. Campbell, Chief of Test Labs

Witnessed by CVA Inspector

Witnessed by USAF Inspector

REVISIONS

NO.	DATE	BY	CHANGE	PAGES AFFECTED
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INTRODUCTION:

The Telepak Assembly Unit is a device which converts instrumentation measurement signals into 0-5 VDC inputs to voltage controlled oscillators.

OBJECTIVE:

The test objective is to determine the ability of the signal conditioning portion of the Telepak Assembly to comply with the requirements of test procedure 55B636.

Additional testing was conducted to solve cannister shock mount problems which arose during vibration tests.

CONCLUSIONS:

The signal conditioning portion of Telepak Assembly Unit 55-13503-500, S/N 1 passed flight proofing tests with several major exceptions. Differential amplifier 55-01120-1 failed while the package was being subjected to radiant heating and had to be replaced. Rubber O rings used on the shock mounts failed four times during 8G sinusoidal vibration tests. An 8G sweep along the X axis of Mercury specimen 27-12290-1, S/N 1 damaged its O rings (see Figures 1 and 2). O rings were replaced with rubber inserts to solve the vibration problem. The test specimen failed to comply with applicable sections of radio interference specification MIL-I-26600.

Minor problems included failure of several module output voltages to meet design specifications and an 800 cps noise voltage on the 28 VDC bus. Several output signals drifted as testing progressed. Some modules were affected by severe environments.

RECOMMENDATIONS:

It is recommended that rubber inserts, properly cemented to the cannister per vendor instructions be used in place of the O rings until more information can be obtained concerning the problem. Steps should be taken to eliminate the 800 cps noise problem.

SPECIMEN:

Centaur specimen 55-13503-500, S/N 1 was used for tests called out in the procedure. Additional vibration tests were performed with Mercury specimen 27-12290-1 S/N 1.

TEST PROCEDURE:

Test Procedure 55B 636, used in this test, is included in Appendix A.

TEST RESULTS:

Initial Satisfactory Performance Test: Several transducer power supply outputs did not comply with the specifications. The demodulater output voltage was about 250 mv low for each input. This might have been due to a leading down of the 2.5 VDC bias voltage. The crystal rectifier performed satisfactorily. Maximum test input to the DC section was 30.25 VDC as any larger voltage might have damaged other modules connected to the 28 VDC bus. The commutator power supply apparently was feeding an 800 cycle signal onto the 28 VDC bus.

As a result, most other modules had a 100-200 mv noise component on the output signal. The other modules performed satisfactorily. These results were brought to the attention of the design group and testing was continued.

Acceleration: The specimen was subjected to 10.0 G acceleration for at least 30 seconds in each direction along each axis and passed these tests satisfacterily.

Altitude: An attempt to reach an altitude of 10^{-5} mm of Hg, did not proceed beyond 2.0 x10 $^{-4}$ mm of Hg due to leakage problems. The specimen operated satisfactorily throughout the test.

Temperature-Humidity: The specimen was subjected to radiant heating as called out in Paragraph 5.5-a of the procedure.

Maximum non-operating temperature was found to be 133°F. A visual inspection of the unit revealed that several epoxy boards in the package were starting to warp and that one had a slight crack. A proof cycle showed that differential amplifier, S/N 113 had no output voltage. This amplifier was replaced with S/N 112 and testing was continued. A proof cycle after procedure Paragraph 5.5-b (-30°F) showed that AC section outputs of the crystal rectifier were 0.5-0.6 VDC too high. Function tone generator outputs 7, 8, 9 and 10 were 20 cps too high.

TEST RESULTS: (Continued)

The specimen was returned to 80°F. At this temperature all function tone generator outputs were normal. Crystal rectifier outputs were still 0.4-0.6 VDC high and remained high during subsequent tests. A proof cycle at 110°F and 95% relative humidity revealed that several commutator segments had become noisy. Amplifier gains of Ch 7 and 8 were low and remained low during the following tests. The calibrator module would not operate at this time, but worked satisfactorily during the proof cycle of Section 5.5-d (40°F and 95% relative humidity). Several transducer power supply voltages were not within limits at this point.

A proof cycle after temperature shock tests revealed that the negative gates of all commutated channels were at -1.0 VDC instead of -1.25 VDC. A visual inspection of the specimen components after the series of tests revealed that epoxy boards were warping more and exposed metal was beginning to rust. These results were brought to the attention of the design group before testing was continued.

Vibration: The specimen was subjected to 8 G's sinusoidal vibration along each axis. The Z axis sweep was completed satisfactorily. (See Figure 3 for the axes designations). The Y axis sweep progressed to 97 cps at which point the shock mount O rings were worn very badly. They were replaced and a second sweep begun at 50 cps. The O rings started to wear badly at 68 cps but held until the sweep was completed. At the start of this sweep the differential amplifier (S/N 112) output of Ch 8 fell off, but returned during the sweep. The demodulator output amplitude fluctuated during this sweep.

The O rings were replaced and an X axis sweep progressed to 18 cps. At that point the O rings were very badly worn and replaced. The next sweep was begun at 100 cps and progressed to 2000 cps without incident. Then a sweep was started toward zero from 100 cps and proceeded to 68 cps. At 68 cps the package was receiving 72 G's and the O rings were in very bad condition. No further vibration was done using this specimen. The shock mount seats, Astronautics machined, were worn and may have contributed to rapid deterioration of the O rings. At this point the signal conditioning portion of the specimen was working satisfactorily. A loose screw on the VCO module voltage regulator was noted upon visual inspection of the specimen.

TEST RESULTS: (Continued)

To obtain more data and determine if test specimen shock mount seats might have been improperly machined, a Project Mercury Specimen (27-12290-1, S/N-1) was subjected to an X axis sweep. This specimen had an R.F. section installed whereas the original test specimen contained a dummy mass and electrical lead. The Mercury specimen was machined entirely by the vendor and had successfully passed vendor vibration tests. The X axis sweep was completed to 2000 cps although the O rings were badly worn at 100 cps (see Figures 1 and 2). At 68 cps the specimen experienced a maximum G level -180. These results were brought to the attention of the design group and the vendor. The vendor indicated improper O rings, made of too soft a rubber had been used. A vendor supplied, rubber insert was glued to the specimen and used in place of O rings at each mounting hole. The specimen was then subjected to a 0-2000 cps vibration sweep along each axis. Both shock mounts and rubber inserts were intact after the three sweeps. The rubber inserts were only slightly worn. Mounting plate G levels were monitored at the four shock mount locations. The shaker input was controlled to keep the G level of all four locations at not more than 80's. When using O rings, most of the damage occurred during X and Y axis sweeps around 70 cps. Damage when using inserts occurred mainly during Z axis vibration at about 174 cps. Figure 3 shows the setup for the Z axis sweep using rubber inserts.

Radio Interference: The specimen was subjected to and failed to pass the MIL-I-26600 requirements for conducted interference, radiated interference and audio susceptibility. Tests were conducted by Department 551-7 and complete results published in Test Report AE61-0377.

Life Test: With all power, signals and leads applied, the specimen was operated in cycles of 5 hours "on time" and 1 hour "off time" until 500 hours of "on time" had been accumulated. The specimen performed satisfactorily during the 500 hours with one exception. At 440 hours the transducer power supply 8.8 VDC (adjustable) output fell off to 2.2 volts and varied from 2-5 volts during the remainder of the test. No further changes were noted in signals that had shifted during previous tests.

NOTE: The data from which this report was prepared is recorded in Astronautics Engineering Test Laboratories Notebook Number 7611.

5.2 I.S.P.T.

Reference Paragraph 5.2.2
Transducer Power Supply Test

Date 3/18/61
Test Eng. R.H. Troester
Witness C.W. Hartley
USAF Witness
Start Time 409.8
End Time 999.0

Input Voltage (Volts DC)	24.75	27.50	30.25
Output Voltage Limits (Volts DC)	-5.94 to -6.06	-5.94 to -6.06	-5.94 to -6.06
Meter Reading	-5.839	-5.849	-5.867
Output Noise Level (Volts AC)	0.04 Max	0.04 Max	0.04 Max
Meter Reading	0.02 + 200 mv spikes	0.02 + 200 mv spikes	0.02 + 200 mv spikes
Output Voltage Limits (Volts DC)	-1.21 to -1.27	-1.21 to -1.27	-1.21 to -1.27
Meter Reading	-1.228	-1.230	-1.233
Output Noise Level (Volts AC)	0.04 Max	0.04 Max	0.04 Max
Meter Reading	0.02 + 90 mv spikes	0.02 + 90 mv spikes	0.02 + 90 mv spikes
Output Voltage Limits (Volts DC)	2.494 - 2.506	2.494 - 2.506	2.494 - 2.506
Meter Reading	2.533	2.533	2.533
Output Noise Level (Volts AC)	0.02 Max	0.02 Max	0.02 Max
Meter Reading	0.02 + 100 mv spikes	0.04 + 100 mv spikes	0.045 + 110 mv spikes
Output Voltage Limits (Volts DC)	4.999 - 5.001	4.999 - 5.001	4.999 - 5.001
Meter Reading	5.079	5.079	5.079
Output Noise Level (Volts AC)	0.02 Max	0.02 Max	0.02 Max
Meter Reading	0.03 + 90 mv spikes	0.025 + 90 mv spikes	0.025 + 90 mv spikes

R.H. Troester

5.2 I.S.P.T. (Continued)

Reference Paragraph 5.2.2 — Transducer Power Supply Test (Continued)

Output Voltage Limits (Volts DC)	5.0 - 5.2	5.0 - 5.2	5.0 - 5.2
Meter Reading	5.140	5.146	5.158
Output Noise Level (Volts AC)	0.05 Max	0.05 Max	0.05 Max
Meter Reading	0.02 + 200mv spikes	0.02 + 200mv spikes	0.02 + 200mv spikes
Output Voltage Limits (Volts DC)	5.1 - 5.3	5.1 - 5.3	5.1 - 5.3
Meter Reading (Floating)	4.85	4.84	4.86
Output Noise Level (Volts AC)	0.05 Max	0.05 Max	0.05 Max
Meter Reading	—	—	—
Output Voltage Limits (Volts DC)	7.75 - 8.25	7.75 - 8.25	7.75 - 8.25
Meter Reading	8.488	8.498	8.515
Output Noise Level (Volts AC)	0.05 Max	0.05 Max	0.05 Max
Meter Reading	0.02 + 175mv spikes	0.02 + 175mv spikes	0.02 + 175mv spikes
Output Voltage Limits (Volts DC)	8.6 - 9.0	8.6 - 9.0	8.6 - 9.0
Meter Reading (Temps)	8.62	8.63	8.65
Output Noise Level (Volts AC)	0.05 Max	0.05 Max	0.05 Max
Meter Reading	200mv	200mv	200mv

5.2 I.S.P.T. (Continued)

Reference Paragraph 5.2.3 Crystal Rectifier Test

Input Voltage	Output Voltage Limits (Volts DC)	Meter Reading	Output Noise Level (Volts AC)	Meter Reading
Section A (Volts DC)				
+20.0	±150 mv	+40mv	0.04 Max	0.12v Spikes
+25.0	1.5-1.8	1.56	0.04 Max	0.12v spikes
+30.0	—	—	0.04 Max	—
30.25 ~~+35.0~~	3.3 - 3.5 ~~4.85 - 5.15~~	3.18	0.04 Max	0.12v spikes
Section B (Volts AC)				
105.0	±250 mv	+80mv	0.04 Max	0.03 *
110.0	1 - 1.5	1.20	0.04 Max	
115.0	2.25-2.75	2.50	0.04 Max	
120.0	3.5-4.0	3.70	0.04 Max	
125.0	4.75 - 5.25	5.00	0.04 Max	0.03 *

* Also 100mv P-P of 800 c/s noise present from commutator power supply.

5.2 I.S.P.T. (Continued)

Reference Paragraph 5.2.3 Crystal Rectifier Test

Input Voltage Limits (Volts DC)	Output Voltage Limits (Volts DC)	Meter Reading	Output Noise Level (Volts AC)	Meter Reading
Section C (Volts AC)				
105.0	±250 mv	0 mv	0.04 Max	0.03 *
110.0	1-1.5	1.20	0.04 Max	
115.0	2.25-2.75	2.50	0.04 Max	
120.0	3.5-4.0	3.70	0.04 Max	
125.0	4.75-5.25	5.00	0.04 Max	0.03 *
Section D (Volts AC)				
105.0	±250 mv	+80 mv	0.04 Max	0.03 *
110.0	1-1.5	1.20	0.04 Max	
115.0	2.25-2.75	2.50	0.04 Max	
120.0	3.5-4.0	3.70	0.04 Max	
125.0	4.75-5.25	5.00	0.04 Max	0.03 *

* Also 100 mv P-P of 800 ~ noise present from the commutator power supply.

5.2 I.S.P.T. (Continued)

Reference Paragraph 5.2.4 Rate Demodulator Test

Input Voltage (Volts AC)	Output Voltage Limits (Volts DC)	Meter Reading	Output Noise Level (Volts AC)	Meter Reading
Out of Phase				
0.125	±40 mv	-300mv ✓	0.05 Max	50mv *
0.100	0.4 - 0.6	+200mv ✓	0.05 Max	
0.075	0.9 - 1.10	+720mv ✓	0.05 Max	
0.050	1.4 - 1.6	1.22 L	0.05 Max	
0.025	1.9 - 2.1	1.72 ✓	0.05 Max	
0	2.4 - 2.6	2.25 ✓	0.05 Max	
In Phase				
0	2.4 - 2.6	2.25 ✓	0.05 Max	
0.025	2.7 - 3.1	2.72 ✓	0.05 Max	
0.050	3.4 - 3.6	3.22 ✓	0.05 Max	
0.075	3.7 - 4.1	3.75 ✓	0.05 Max	
0.100	4.4 - 4.6	4.25 LOW	0.05 Max	
0.125	4.90-5.10	4.75	0.05 Max	50 mv *

* Also 100 mv of 800 C/S noise from commutator power supply.

5.2 I.S.P.T. (Continued)

Reference Paragraph 5.2.5 Differential Amplifier Test

	Amplifier No 1 Section A	Amplifier No 1 Section B	Amplifier No 2
Gain Limits	49 - 51	49 - 51	49 - 51
Gain	50	50	50
Output Noise Level (Volts AC)	0.05 Max	0.05 Max	0.05 Max
Meter Reading	0.02 *	0.02 *	0.02 *

* Also 100 mv spikes from commutator power supply.

Reference Paragraph 5.2.6 Temperature Bridge Test

Satisfactory check ✓

Unsatisfactory explain _____

Note: Some segments noisy.

5.2 I.S.P.T. (Continued)

Reference Paragraph 5.2.7 Circuit Board Assy. Test

Limiter Section

Section	A	B	C	D	F	J	K
Input Voltage (Volts DC)	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
Output Voltage (Volts DC)	-1.8	-1.8	-1.8	-1.8	-1.8	-1.8	-1.8
Input Voltage (Volts DC)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Output Voltage (Volts DC)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Input Voltage (Volts DC)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Output Voltage (Volts DC)	+1.0	+1.0	+1.0	+1.0	+1.0	+1.0	+1.0
Input Voltage (Volts DC)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Output Voltage (Volts DC)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Input Voltage (Volts DC)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Output Voltage (Volts DC)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Input Voltage (Volts DC)	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Output Voltage (Volts DC)	5.7	5.7	5.7	5.7	5.7	5.7	5.7

5.2 I.S.P.T. (Continued)

Reference Paragraph 5.2.7 Circuit Board Assy. Test

Blip Section

Satisfactory check ✓

Unsatisfactory explain _____

Divider Section

Output Voltage Limits ___ -1.0 volts DC-Minimum

Meter Reading -1 VDC, also 80mvc of noise

5.2 I.S.P.T. (Continued)

Reference Paragraph 5.2.8 Function Tone Generator Test

Channel	1	2	3	4	5
Input Voltage (Volts DC)	27.5	27.5	27.5	27.5	27.5
Output Frequency Limits (cps)	28 - 38	69 - 79	110 - 120	151 - 161	192 - 202
Meter Reading	33	76	118	158	200
Output Voltage Limits (RMS) ~~(Peak to Peak)~~	0.071 to 0.087	0.071 to 0.087	0.115 to 0.141	0.154 to 0.188	0.198 to 0.242
Meter Reading	0.091	0.084	0.131	0.175	0.220
Interference caused by other channels	No apparent channel interference or beat frequencies on the output of the Function Tone Generator.				

Note: 150mv P-P at 800 c/s Noise Present from Comm. P.S.

5.2 I.S.P.T. (Continued)

Reference Paragraph 5.2.8 Function Tone Generator Test

Channel	6	7	8	9	10
Input Voltage (Volts DC)	27.50	27.50	27.50	27.50	27.50
Output Frequency Limits (cps)	233 - 243	274 - 284	315 - 325	356 - 366	397 - 407
Meter Reading	245	280	322	364	403
Output Voltage Limits (Volts ~~RMS Peak-to-Peak~~)	0.245 to 0.299	0.289 to 0.353	0.322 to 0.392	0.369 to 0.451	0.407 to 0.497
Meter Reading	0.268	0.315	0.358	0.412	0.443
Interference caused by other channels	No apparent Beat Frequencies or Noise Problems on the output of the Function Tone Generator.				

5.2 I.S.P.T. (Continued)

Reference Paragraph 5.2.9 Commutator Power Supply Test

Input Voltage - +27.5 Volts DC

Output Voltage Limits - 98 - 126.5 Volts AC

Meter Reading 112 V RMS Comm. ON

Reference Paragraph 5.2.10 Power Changeover and Commutator Command Relay Test

Power Changeover Relay

Satisfactory check ✓

Unsatisfactory explain _____

Commutator Command Relay

Satisfactory Check ✓

Unsatisfactory explain _____

5.2 I.S.P.T. (Continued)

Reference Paragraph 5.2.11 Filter Limiter Test

Channel	1	4
Input Voltage	115 Volts AC	as in Figure 1
Output Voltage Limits ~~(Millivolts AC)~~ Volts AC P-P	~~5.7-6.2~~ .7-1.3	~~5.7-6.2~~ .7-1.3
Output Voltage Volts AC P-P	1.0	0.7 - 1.0 - 0.8
Output Frequency (cps)	~~888 - 1032~~ 370 - 430	~~4995 - 5805~~ 888 - 1032
Output Frequency	400	888 - 960 - 1032

I. S. P. T. Additional Mercury Modules

Calibrator

Calibrator Off
Output Voltage - 2.5 Volts D. C. (Nominal) O.K.

Calibrator On
Output - 0-5 Volts D. C. square wave for 15-35 seconds, frequency approximately 1 cps.
Oscilloscope Reading OK.

Sub-Carrier Oscillators

Ch II

Input Voltage	0	+1.25	+2.5	+3.75	+5.0
Output Frequency	6,798	7072	7346	7,622	7,897
Linearity	OK				

Ch A

Input Voltage	-.6	+.15	+.9	+1.65	+24
Output Frequency	18,670	20,380	22,043	23,679	25,300
Linearity	OK				

5.4, 5.5, 5.6 Operational Tests

X, Axis Acceleration

Date 3/22/61
Test Eng. R.H. Forester
Witness
USAF Witness
Start Time 1045
End Time 1118

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator ↓ Lim. Filter	✓	
Differential Amplifiers	✓	
Temperature Bridges	✓	

R.H. Forester

5.4, 5.5, 5.6 Operational Tests (Continued)

Module	Satisfactory Check	Unsatisfactory Explain
Circuit Board Assembly	✓	
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	

5.4, 5.5, 5.6 Operational Tests (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	Not Checked	
SUBCARRIER OSCILLATORS Ch II and Ch A	Not checked	

5.3 Proof Cycle Test

After X, Axis Acceleration

Date 3/22/61
Test Eng. R.H. Forester
Witness [signature]
USAF Witness
Start Time 1118
End Time 1160

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator ↓ Lim. Filter	✓	
Differential Amplifiers	✓	Note: Leading edges of Commutator Segments are Rounded off
Temperature Bridges	✓	

R.H. Forester

5.3 Proof Cycle Test (Continued)

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.4, 5.5, 5.6 Operational Tests

X_2 Axis Acceleration

Date 3/22/61
Test Eng. R H Tracster
Witness
USAF Witness
Start Time 1160
End Time 1163

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator	✓	
Differential Amplifiers	✓	
Temperature Bridges	✓	

R. H. Tracster

5.4, 5.5, 5.6 Operational Tests (Continued)

Module	Satisfactory Check	Unsatisfactory Explain
Circuit Board Assembly	✓	
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	

5.4, 5.5, 5.6 Operational Tests (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	Not checked	
SUBCARRIER OSCILLATORS Ch II and Ch A	Not checked	

5.3 Proof Cycle Test

After X_2 Axis Acceleration

Date 3/22/60
Test Eng. R.H. Tracester
Witness
USAF Witness
Start Time 1163
End Time 1190

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator ↓ Lim Filter	✓	
Differential Amplifiers	✓	
Temperature Bridges	✓	

R.H. Tracester

5.3 Proof Cycle Test (Continued)

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.4, 5.5, 5.6 Operational Tests
Y_1 Axis Acceleration

Date 3/22/61
Test Eng. R. H. Troester
Witness [illegible]
USAF Witness
Start Time 1191
End Time 1196

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator ↓ Lim. Fist	✓	
Differential Amplifiers	✓	
Temperature Bridges	✓	

R. H. Troester

5.4, 5.5, 5.6 Operational Tests (Continued)

Module	Satisfactory Check	Unsatisfactory Explain
Circuit Board Assembly	✓	
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	

5.4, 5.5, 5.6 Operational Tests (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	Not Checked	
SUBCARRIER OSCILLATORS Ch II and Ch A	Not Checked	

5.3 Proof Cycle Test
After Y, AXIS ACCELERATION

Date 3/22/61
Test Eng. R.H. Troester
Witness [signature]
USAF Witness _____
Start Time 1196
End Time 1212

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator ↓ = Lim Filt	✓	
Differential Amplifiers	✓	
Temperature Bridges	✓	

R.H. Troester

5.3 Proof Cycle Test (Continued)

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.4, 5.5, 5.6 Operational Tests
Y_2 Axis Acceleration

Date 3/22/61
Test Eng. R. H. Troester
Witness
USAF Witness
Start Time 1212
End Time 1216

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator Lin Fit	✓	
Differential Amplifiers	✓	
Temperature Bridges	✓	

R. H. Troester

5.4, 5.5, 5.6 Operational Tests (Continued)

Module	Satisfactory Check	Unsatisfactory Explain
Circuit Board Assembly	✓	
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	

5.4, 5.5, 5.6 Operational Tests (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	Not Checked	
SUBCARRIER OSCILLATORS Ch II and Ch A	Not checked	

5.3 Proof Cycle Test

After Y_2 Axis Acceleration

Date 3/22/61
Test Eng. R.H. Forrester
Witness
USAF Witness
Start Time 1216
End Time 1238

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator Lim. Filt.	✓	
Differential Amplifiers	✓	
Temperature Bridges	✓	

R. H. Forrester

5.3 Proof Cycle Test (Continued)

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutater Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.4, 5.5, 5.6 Operational Tests

Z, Axis Acceleration

Date 3/22/61
Test Eng. R H Troester
Witness [illegible]
USAF Witness
Start Time 1238
End Time 1243

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator + Lim Filt	✓	
Differential Amplifiers	✓	
Temperature Bridges	✓	

R. H. Troester

5.4, 5.5, 5.6 Operational Tests (Continued)

Module	Satisfactory Check	Unsatisfactory Explain
Circuit Board Assembly	✓	
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay.	✓	

5.4, 5.5, 5.6 Operational Tests (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	Not checked	
SUBCARRIER OSCILLATORS Ch II and Ch A	Not checked	

5.3 Proof Cycle Test
After Z, Axis Acceleration

Date 3/22/61
Test Eng. R H Troester
Witness
USAF Witness
Start Time 1243
End Time 1252

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator ↓ Lm Filt	✓	
Differential Amplifiers	✓	
Temperature Bridges	✓	

R. H. Troester

5.3 Proof Cycle Test (Continued)

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.4, 5.5, 5.6 Operational Tests
Z_2 Axis Acceleration

Date 3/22/61
Test Eng. R H Troestee
Witness C Whatley
USAF Witness
Start Time 1252
End Time 1266

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator + Lim Filt	✓	
Differential Amplifiers	✓	
Temperature Bridges	✓	

R. H. Troestee

5.4, 5.5, 5.6 Operational Tests (Continued)

Module	Satisfactory Check	Unsatisfactory Explain
Circuit Board Assembly	✓	
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	

5.4, 5.5, 5.6 Operational Tests (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	Not checked	
SUBCARRIER OSCILLATORS Ch II and Ch A	Not checked	

5.3 Proof Cycle Test

After Z_2 Axis Acceleration

Date 3/22/61
Test Eng. R. H. Tooster
Witness
USAF Witness
Start Time 1256
End Time 1371

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier .	✓	
Rate Demodulator ↓ Lim Fixt	✓	
Differential Amplifiers	✓	
Temperature Bridges	✓	

R. H. Tooster

5.3 Proof Cycle Test (Continued)

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	Ch II: 6800 7360 7915 Ch A: 18,782 22,141 25,407	

5.4, 5.5, 5.6 Operational Tests

High Altitude

Date 3/23/61
Test Eng. R H Troester
Witness C W Hartley
USAF Witness
Start Time 1400
End Time 1690

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator ↓ Lin Fit	✓	
Differential Amplifiers	✓	
Temperature Bridges	✓	

R. H. Troester

5.4, 5.5, 5.6 Operational Tests (Continued)

Module	Satisfactory Check	Unsatisfactory Explain
Circuit Board Assembly	✓	
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	

5.4, 5.5, 5.6 Operational Tests (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test
After High Altitude

Date 3/23/61
Test Eng. R H Forester
Witness
USAF Witness
Start Time 1640
End Time 1680

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator + Lim Flat	✓	
Differential Amplifiers	✓	
Temperature Bridges	✓	

R. H. Forester

5.3 Proof Cycle Test (Continued)

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutater Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test
After Section 5.5 a
Radiant Heat

Date 3/24/61
Test Eng. R H Forester
Witness
USAF Witness
Start Time 1691
End Time 1796

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator + Lin Fit	✓	
Differential Amplifiers		No output on amplifier of ch 8. Amplifier was replaced.
Temperature Bridges	✓	

R. H. Forester

5.3 Proof Cycle Test (Continued)

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test
After Section 5.5 b
(-30°F + 3.44 "oA Hg)

Temp. At 0°F During this Proof Cycle.

Date 3/25/61
Test Eng. R. H. Trocster
Witness [illegible]
USAF Witness
Start Time 1797
End Time 1890

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier		Output Voltages MAY Be Starting to DRIFT. A.C. Section Outputs ARE .5 to .6 Volts too high At this temperature.
Rate Demodulator & Lm Filter	✓	
Differential Amplifiers	✓	
Temperature Bridges	✓	

R. H. Trocster

5.3 Proof Cycle Test (Continued)

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator		The output frequencies of ch 2.10.7 through 2.10.10 are all about 20 c/s too high at this temperature.
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test

After Para 5.5 c
Temp-Humidity Env.

110°F +95% Rel. Humidity
During Proof Cycle

Date 3/27/61
Test Eng. R H Troester
Witness C.E. Bartley
USAF Witness
Start Time 1933
End Time 2054

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply		5.00 CALIB. SIGNAL IS .11 Volts too high
Crystal Rectifier		AC Section outputs are about .6 VDC too high for the range of inputs.
Rate Demodulator + Lin Filter	✓	
Differential Amplifiers		Gain Ch7 - 47 Ch8 - 46 Ch9 - 50 - OK
Temperature Bridges		Many Segments are noisy. Some Resistance Values may have changed.

R. H. Troester

5.3 Proof Cycle Test (Continued)

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR		The CALIBRATOR FAILED to operate.
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test

After 40°F + 95% Relative Humidity for 4 hours

Date 3/27/61
Test Eng. R H Troester
Witness
USAF Witness
Start Time 2056
End Time 2126

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply		Several outputs out of spec. -1.16 +2.56 +5.10
Crystal Rectifier		D.C. Section OK. A.C. Section outputs .4-.6 volts too high.
Rate Demodulator + Lin Filter	✓	
Differential Amplifiers		Gain Ch 7 - 47 " Ch 8 - 48 " Ch 9 - 50
Temperature Bridges		Noisy segments present Resistance values may have changed.

R. H. Troester

5.3 Proof Cycle Test (Continued)

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓ *	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

* Note: CALIBRATOR DIDN'T WORK AT END OF LAST PROOF CYCLE.

5.3 Proof Cycle Test

After Section 5.5.2
Temp. Shock Test

Date 3/29/61
Test Eng. R.H. Troester
Witness
USAF Witness
Start Time 2130
End Time 2200

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply		Several outputs out of spec: -1.19 v cal +2.56 v cal +5.12 v cal
Crystal Rectifier		A.C. Section Outputs High
Rate Demodulator + Lim Filter	✓	
Differential Amplifiers		Ch 7 - Gain 47 Ch 8 - Gain 48
Temperature Bridges		Some Noisy Segments Some Resistances may have changed.

R. H. Troester

5.3 Proof Cycle Test (Continued)

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test
PRIOR to VIBRATION

Date 3/30/61
Test Eng. R H TROESTER
Witness
USAF Witness
Start Time 2382
End Time 2600

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier .		AC VOLTAGE OUTPUTS ARE ABOUT .6V DC too high
Rate Demodulator + Lim Filt	✓	
Differential Amplifiers		GAINS OFF AS IN LAST PROOF CYCLE
Temperature Bridges		Some Segments NOISY

R H Troester

5.3 Proof Cycle Test (Continued)

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.4, 5.5, 5.6 Operational Tests

Z Axis Vibration

Date 3/31/61
Test Eng. R H Troester
Witness
USAF Witness
Start Time 2697
End Time 2710

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator + Lim Filt	✓	
Differential Amplifiers	✓	
Temperature Bridges	✓	

R. H. Troester

5.4, 5.5, 5.6 Operational Tests (Continued)

Module	Satisfactory Check	Unsatisfactory Explain
Circuit Board Assembly	✓	
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	

5.4, 5.5, 5.6 Operational Tests (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test
After Z Axis Vibration

Date 3/31/61
Test Eng. R.H. Tweester
Witness
USAF Witness
Start Time 2720
End Time 2750

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier		Outputs of A.C. section .6VDC high.
Rate Demodulator + Lin Filter	✓	
Differential Amplifiers		Ch 7+8 GAINS LOW
Temperature Bridges	✓	

R. H. Tweester

5.3 Proof Cycle Test (Continued)

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.4, 5.5, 5.6 Operational Tests

Y Axis

Date 3/31/61
Test Eng. R.H. Troester
Witness
USAF Witness
Start Time 2767
End Time 2890

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator Lin Filt	OK	Demod. output amplitude varied at low vibration frequencies (60-90 c/s)
Differential Amplifiers		Ch 8 amplifier lost output for a time. Output later came back satisfactorily
Temperature Bridges	✓	

R.H. Troester

5.4, 5.5, 5.6 Operational Tests (Continued)

Module	Satisfactory Check	Unsatisfactory Explain
Circuit Board Assembly	✓	
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	

5.4, 5.5, 5.6 Operational Tests (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test
After Y Axis Vibration

Date 3/31/61
Test Eng. R H Troester
Witness
USAF Witness
Start Time 2890
End Time 2910

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier		outputs high
Rate Demodulator ↓ Lim Filt	✓	Amplitude Noisy
Differential Amplifiers		Ch 7 & 8 Gains Low
Temperature Bridges		Some Segments Not at proper value

R H. Troester

5.3 Proof Cycle Test (Continued)

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.4, 5.5, 5.6 Operational Tests

X Axis VIBRATION

Date 3/31/61
Test Eng. R.H. Troester
Witness
USAF Witness
Start Time 2910
End Time 2930

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator ~~Lim Filt~~		Demod Output Noisy At Low Freq. (60-70%) of VIBRATION
Differential Amplifiers	✓	
Temperature Bridges	✓	

R. H. Troester

5.4, 5.5, 5.6 Operational Tests (Continued)

Module	Satisfactory Check	Unsatisfactory Explain
Circuit Board Assembly	✓	
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	

5.4, 5.5, 5.6 Operational Tests (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test
After X Axis Vibration

Date 3/31/61
Test Eng. R. H. Tronster
Witness
USAF Witness
Start Time 2930
End Time 2941

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator + Lin Filter	✓	Output of Demod OK
Differential Amplifiers		Outputs Present Gain of ch 7 + ch 8 Low
Temperature Bridges		Some segments Noisy

R. H. Tronster

5.3 Proof Cycle Test (Continued)

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS, Ch II and Ch A	✓	

5.3 Proof Cycle Test
PRIOR to start of Life Testing

Date 4/6/61
Test Eng. P H TROESTER
Witness
USAF Witness
Start Time 2946
End Time 3068

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier		ØC output high FOR ALL INPUTS ØA 125V IN gives 5.4 UDC out, SHOULD BE 5.0 V.
Rate Demodulator + Lim Filter	✓	
Differential Amplifiers		GAIN Ch7 47 " Ch8 48 " Ch9 50
Temperature Bridges	✓	

R. H. Troester

5.3 Proof Cycle Test (Continued)

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test

Life Test

Date 4/7/61
Test Eng. R.H. Troester
Witness C.D. Bailey
USAF Witness
Start Time 3973
End Time 3993

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator Lim. Filter	✓	
Differential Amplifiers		Ch 7 & 8 GAINS LOW
Temperature Bridges	✓	

R. H. Troester

5.3 Proof Cycle Test (Continued)

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test

Life Test

Date April 17 1961
Test Eng. Treester
Witness C.O. Hostetter
USAF Witness
Start Time 9:00 AM
End Time

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator Lim Fil	✓	
Differential Amplifiers		CH 7 & 8 Low Gain on Amplifier
Temperature Bridges	✓	

R.H. Treester

5.3 Proof Cycle Test (Continued)

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

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MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test

Life Test

Date 4/18/61
Test Eng. Tracster
Witness C.D. Hartley
USAF Witness
Start Time 9:00 AM
End Time 10:00 AM

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator Lim Fil	✓	
Differential Amplifiers		CH 7 & 8 Low Gain
Temperature Bridges	✓	

R. H. Tracster

5.3 Proof Cycle Test (Continued)

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.2 Proof Cycle Test (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test

Life Test

Date 4/19/61
Test Eng. Troester
Witness C.A. Battig
USAF Witness
Start Time 8:15
End Time

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator L. F.	✓	
Differential Amplifiers		Low on CH 7 & 8
Temperature Bridges	✓	

R.N. Troester

5.3 Proof Cycle Test (Continued)

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test
Life Test

Date 4/20/61
Test Eng. Troester
Witness C. Hartley
USAF Witness
Start Time 9:35
End Time

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator L. F.	✓	
Differential Amplifiers		CH 7 & 8 Low
Temperature Bridges	✓	

R.H. Troester

5.3 Proof Cycle Test (Continued)

Life Test

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test

Life Cycle

Date 4/21/61
Test Eng. Troester
Witness C. Stallings
USAF Witness
Start Time 9:15
End Time 10:15

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator L. F.	✓	
Differential Amplifiers	✓ Note 1 →	CH 7 & 8 Low
Temperature Bridges	✓	

R. H. Troester

5.3 Proof Cycle Test (Continued)

Life Cycle

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

Life Cycle

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test
Life Test

Date 4/24/61
Test Eng. Tracster
Witness C. Stuttley
USAF Witness
Start Time 9:15
End Time

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator L.F.	✓	
Differential Amplifiers		CH 7 & 8 Low
Temperature Bridges	✓	

R.N. Tracster

5.3 Proof Cycle Test (Continued)

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test
Life Test

Date April 25-61
Test Eng. Trocster
Witness C.A. Beatty
USAF Witness
Start Time 8:15
End Time

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator L.F.	✓	
Differential Amplifiers		7+8 Low
Temperature Bridges	✓	

R.K. Troester

5.3 Proof Cycle Test (Continued)

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test
L.F. Test

Date 4/26/61
Test Eng. Troester
Witness C.A. Bailey
USAF Witness
Start Time 8:13
End Time 8:43

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator (L.F.)	✓	
Differential Amplifiers		7X8 Low
Temperature Bridges	✓	

R.K. Troester

5.3 Proof Cycle Test (Continued)

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test

Life Test

Date 4/28/61
Test Eng. Forester
Witness C. Whatley
USAF Witness
Start Time 8:30
End Time

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator L.F.	✓	
Differential Amplifiers	✓	7+8 Low
Temperature Bridges	✓	

R. H. Forester

5.3 Proof Cycle Test (Continued)

Life Test

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle/Test (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test

Life Cycle

Date 4/27/61
Test Eng. Troester
Witness C.D. Hartley
USAF Witness
Start Time 2134
End Time

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator L.F.	✓	
Differential Amplifiers		748 Low
Temperature Bridges	✓	

R.H. Troester

5.3 Proof Cycle Test (Continued)

Life Cycle

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

Life Test

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test

Life Cycle Test

Date 5/1/61
Test Eng. Forster
Witness [illegible]
USAF Witness
Start Time 8:15
End Time 8:45

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator L.F.	✓	
Differential Amplifiers		7 & 8 Low
Temperature Bridges	✓	

R.H. Tweedie

5.3 Proof Cycle Test (Continued)

Life Test

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)
Life Test

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test

Life Cycle

Date May 2-61
Test Eng. Treesler
Witness C.O. Hartley
USAF Witness
Start Time 8:15
End Time

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator L.F.	✓	
Differential Amplifiers		7/8 Low
Temperature Bridges	✓	

R.H. Toeste

5.3 Proof Cycle Test (Continued)

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test

Life Test

Date 5/3/61
Test Eng. Troester
Witness C.D. Hartley
USAF Witness
Start Time 8:15
End Time 9:45

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator L.F.	✓	
Differential Amplifiers		7th Low
Temperature Bridges	✓	

R. H. Troester

5.3 Proof Cycle Test (Continued)

Life Test

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

Life Test

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test

Life Test

Date 5/4/61
Test Eng. Treester
Witness [illegible]
USAF Witness
Start Time 8:13
End Time 8:45

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator L.F.	✓	
Differential Amplifiers		7 & 8 Low
Temperature Bridges	✓	

R. K. Treester

5.3 Proof Cycle Test (Continued)

Life Test

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

Life Test

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test

Life Cycle

Date 5/15/61
Test Eng. Procter
Witness [illegible]
USAF Witness
Start Time 9:13
End Time 9:45

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator L.F.	✓	
Differential Amplifiers		CA 748 Low
Temperature Bridges	✓	

R. H. Procter

5.3 Proof Cycle Test (Continued)

2, Fe Cycle

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

Life Cycle

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test

Life Cycle

Date 5/8/61
Test Eng. Forrester
Witness [illegible]
USAF Witness
Start Time
End Time

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator L.F.	✓	
Differential Amplifiers		7#8 Low
Temperature Bridges	✓	

R.H. Forrester

5.3 Proof Cycle Test (Continued)

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test

Life Cycle

Date 5/9/61
Test Eng. Thurston
Witness [illegible]
USAF Witness
Start Time 1130
End Time

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator L.F.	✓	
Differential Amplifiers		@ 748 Low
Temperature Bridges	✓	

R. H. Troester

5.3 Proof Cycle Test (Continued)

Life Test

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

Life Test

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test

Life Cycle

Date 5/11/61
Test Eng. Troester
Witness
USAF Witness
Start Time 0116
End Time

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator L.F.	✓	
Differential Amplifiers		CH 7 & 8 Low
Temperature Bridges	✓	

R. H. Troester

5.3 Proof Cycle Test (Continued)

Life Cycle

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

Life Cycle

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test

Life Test

Date 5/11/61
Test Eng. Program
Witness [signature]
USAF Witness
Start Time 2:15
End Time 2:45

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	[redacted] (CVA 1/79)
Rate Demodulator L.F.	✓	
Differential Amplifiers		CH 7+8 Low
Temperature Bridges	✓	

R. N. Torr[illegible]

5.3 Proof Cycle Test (Continued)

Life Cycle

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutater Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

Life Cycle

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test
Life Cycle

Date 5/12/61
Test Eng. Troester
Witness [redacted]
USAF Witness
Start Time 8113
End Time 8113

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	
Crystal Rectifier	✓	
Rate Demodulator L.F.	✓	
Differential Amplifiers	[redacted]	CH 7&8 Low
Temperature Bridges	✓	

R. H. Troester

5.3 Proof Cycle Test (Continued)

Life Test

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

Life Test

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test

Life Cycle

Date 5/15/61
Test Eng. Forrester
Witness E.P. Kelley
USAF Witness
Start Time 8:13
End Time 9:13

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply		8.2 Volts Adj. dropped to 2.2 Volts
Crystal Rectifier	✓	
Rate Demodulator L.F.	✓	
Differential Amplifiers		
Temperature Bridges	✓	748 Low

R.H. Forrester

5.3 Proof Cycle Test (Continued)

Life Cycle

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

Life Cycle

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test

Life Cycle

Date 5/16/61
Test Eng. Forrester
Witness [illegible]
USAF Witness _____
Start Time 8:13
End Time _____

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply	✓	8.2 V. Adjust Reads 5.3 V
Crystal Rectifier	✓	
Rate Demodulator L.F.	✓	
Differential Amplifiers	-	CH 847 Low
Temperature Bridges	✓	

R. H. Forrester

5.3 Proof Cycle Test (Continued)

Life Cycle

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

Life Cycle

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test

Life Cycle

Date 5/17/61
Test Eng. Thrasher
Witness C.H. Hutley
USAF Witness
Start Time 8113
End Time

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply		8.2 Volts Adj. Low
Crystal Rectifier	✓	
Rate Demodulator L.F.	✓	
Differential Amplifiers		CH 7 & 8 Low
Temperature Bridges	✓	

R.H. Thrasher

5.3 Proof Cycle Test (Continued)

Life Cycle

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generator	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

Life Cycle

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

5.3 Proof Cycle Test
Life Cycle

Date 5/18/61
Test Eng. Troester
Witness [redacted]
USAF Witness _____
Start Time 2115
End Time _____

Module	Satisfactory Check	Unsatisfactory Explain
Transducer Power Supply		8.2 Volts Adj. is Low - 4 VDC
Crystal Rectifier	✓	
Rate Demodulator L.F.	✓	
Differential Amplifiers	[redacted]	CH 7 & 8 Low
Temperature Bridges	✓	

R. H. Troester

5.3 Proof Cycle Test (Continued)

Life Cycle

Module	Satisfactory check	Unsatisfactory Explain
Function Tone Generater	✓	
Commutator Power Supply	✓	
Power Changeover Relay	✓	
Commutator Command Relay	✓	
Circuit Board Assembly	✓	

5.3 Proof Cycle Test (Continued)

Life Cycle

MODULE	SATISFACTORY CHECK	UNSATISFACTORY EXPLAIN
CALIBRATOR	✓	
SUBCARRIER OSCILLATORS Ch II and Ch A	✓	

PHOTO INDEX

O RING DETERIORATION

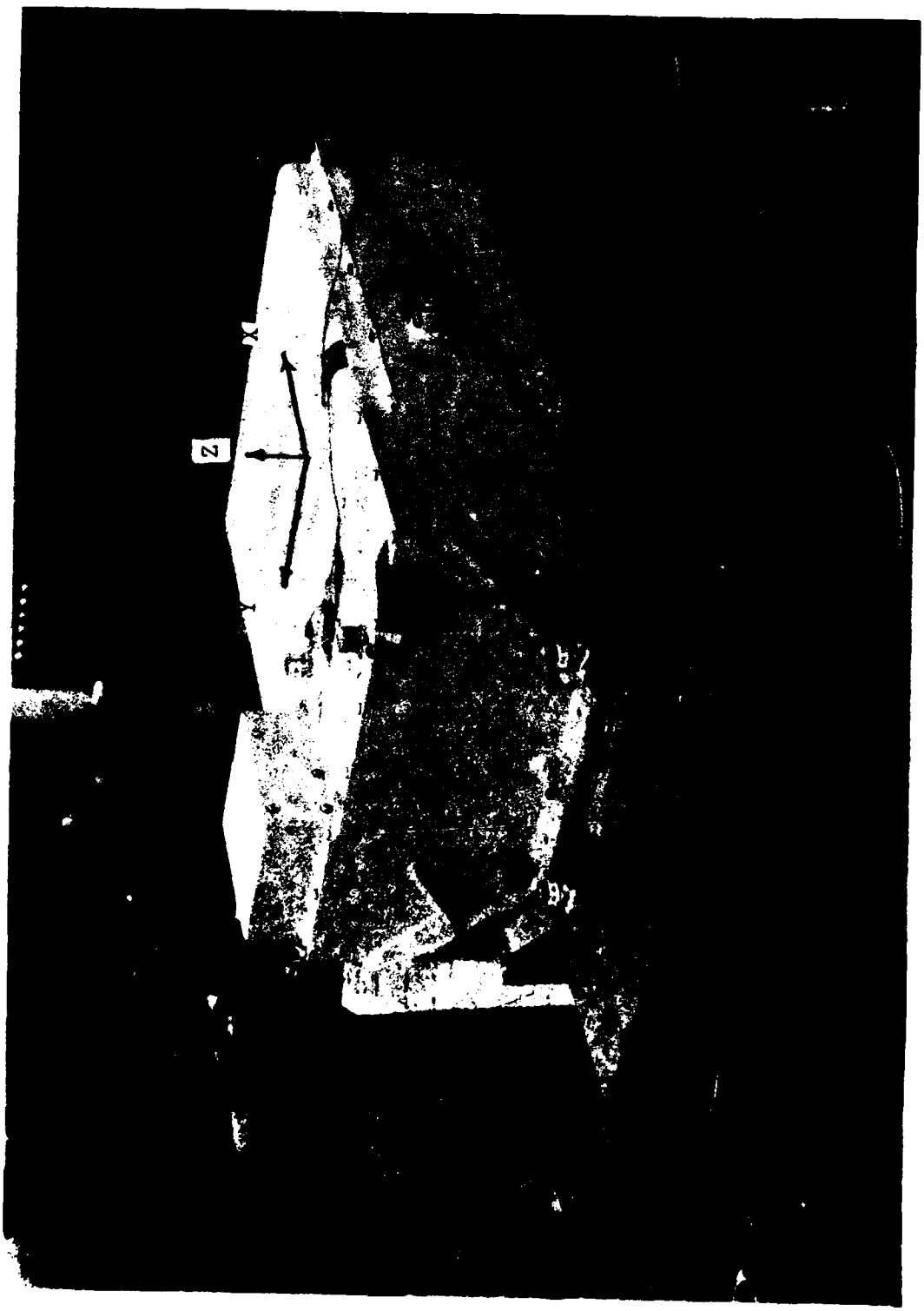
MERCURY SPECIMEN

Figure 1

O RING DETERIORATION

MERCURY SPECIMEN

Figure 2



MOUNTING - Z AXIS VIBRATION

Figure 3

APPENDIX A

REPORT NO 55B636-1
DATE 11 July 1961
[redacted] 178

CONVAIR ASTRONAUTICS

CONVAIR DIVISION OF GENERAL DYNAMICS CORPORATION

FLIGHT PROOFING TEST PROCEDURE

FOR

CENTAUR TELEMAK ASSEMBLY

UNIT 55-13503

REPORT NUMBER 55B636

PREPARED BY R. H. Troeste
for S. A. Schwartz

CHECKED BY [signature]
L. E. Shaw
Asst. Test Lab Group Engr.

Checked by A R Mellenthin 2-28-61
A. R. Mellenthin
Qualification Coordinator

APPROVED BY [signature]
R. S. Campbell
Chief of Test Lab

APPROVED BY [signature]
Design Group Engr.

REVISIONS

NO	DATE	BY	CHANGE	PAGES AFFECTED

FORM NO. A-[redacted]-1

MEMO FOR THE RECORD

The following information shall be added to procedure 55B636.

Add to 3.2 Operating Requirements and Tolerances:

Parameter	Value	Tolerance
Sub-Carrier Oscillators (Used on Mercury Units only)		
Ch 11		
Input Voltage	0-5.0 volts DC	±.1 V
Output Frequency	6799-7901 cps	± 63 cps
Ch A		
Input Voltage	-.6 - +2.4 Volts DC	± .1 V
Output Frequency	18,700 - 25,300 cps	± 379 cps
Pre-Flight Calibrator (Used on Mercury Units only)		
Input Voltage	28 Volts DC	± 3V
Output Voltage	0-5 Volts DC Square Wave at a 1 cps repetition rate of 15-35 seconds duration	± .2 V

Add to 5.2 Initial Satisfactory Performance Test:

5.2.12 Sub-Carrier Oscillators

Monitor output frequencies of each oscillator as the input voltage is varied in five steps over the full range.

5.2.13 Pre-Flight Calibrator

Monitor output waveshape with a 28 volt DC input signal.

Add 5.7 Radio Interference Test:

Radio Interference and Susceptibility Tests shall be conducted to determine compliance with applicable portions of MIL-I-26600. The Radio Interference Lab, Department 551-7 shall determine tests to be performed, designate test points to be used and report test results to the Design Group.

MEMO FOR THE RECORD: (Continued)

Add 5.8 Life Test:

The unit shall be operated under normal laboratory conditions to obtain 500 hours of operation. Four on-off cycles shall be completed each day. Each cycle shall consist of 5 hours "on time" and 1 hour "off time". The unit shall be operated through one proof cycle each day. Operating time during any other portion of the flight proofing test may be applied to the life test requirement. Any repair, adjustment, or maintenance of the unit during this test, unless specifically approved by the Design Group, shall cause the unit to be re-tested until 500 hours of maintenance free operation have been achieved.

Prepared by R. H. Troester
R. H. Troester

Checked by for H. E. Shaw
Asst. Test Lab Group Engr.

Checked by A. R. Mollenkopf
A. R. Mollenkopf
Qualification Coordinator

Approved by
R. S. Campbell
Chief of Test Labs

Approved by
F. T. Sinnott
Design Group Engr.

MEMO FOR THE RECORD

The following information shall be added to Procedure 55B636. Replace 2.6 Sequence of Tests with the following:

The sequence of tests shall be as called out in the body of this report. This sequence may be varied due to time limitations, equipment availability or design considerations.

Prepared by R. H. Troester
R. H. Troester

Checked by for H. R. Shaw
H. R. Shaw
Asst. Test Lab Group Engr.

Checked by K. R. Mollenkopf 5/31
K. R. Mollenkopf
Qualification Coordinater

Approved by R. S. Campbell
R. S. Campbell
Chief of Test Lab

Approved by F. T. Simnett
F. T. Simnett
Design Group Engr.

1.0 PURPOSE:

The purpose of this report is to describe the test equipment and test procedure to be used in flight proofing of the Telepak Assembly Unit, Missileborne, 55-13503.

REFERENCES:

a) 55-13503 Top Assembly - Telepak Assembly.

b) 55-13202 Schematic - Telepak Assembly.

c) 55-01125 Commutator Assembly - Telepak Assembly.

d) 55-13540-1 Transducer Power Supply - Telepak Assembly.

e) 55-13537-1 Crystal Rectifier - Telepak Assembly.

f) 55-13535-1 Commutator Power Supply - Telepak Assembly.

g) 55-13533-1 Limiter Filter - Telepak Assembly.

h) 55-13590 Demodulator Assembly - Telepak Assembly.

i) 55-01104 Function Tone Generator - Telepak Assembly.

j) 55-13557 Temperature Circuit Board - Telepak Assembly.

k) 55-13556 Limiter, Blip and Isolation Circuit Board - Telepak Assembly.

2.0 SPECIAL INSTRUCTIONS:

The environmental tests prescribed in this procedure are written to conform to Convair Report No. 55-00200.

2.1 Nomenclature:

Missileborne Telepak Assembly Unit 55-13503 shall be referred to in the body of this report as the "Test Specimen".

2.0 SPECIAL INSTRUCTIONS: (Cont'd)

2.2 Adjustments and Repairs During Tests:

No adjustments, repairs, or maintenance shall be allowed during test runs except those not due to faults in design, materials, workmanship, or the test conditions imposed. If the unit does not perform satisfactorily during testing, the condition shall be noted and brought to the attention of the design group. Only at the discretion of the design group will testing be continued.

2.3 Test Data:

All data shall be recorded on data sheets such as those in Appendix A. All original data sheets shall be maintained in the System Test Lab files for a period of at least six months. Copies of the original data sheets shall be included in the final report describing the flight proofing tests.

2.4 Witnessing:

All tests covered by this procedure shall be witnessed by a Convair inspector, and the data sheets signed off in the appropriate spaces provided.

2.5 Atmospheric Conditions:

Unless otherwise specified, all tests called out in this procedure shall be performed at an atmospheric pressure between 28 and 32 inches of mercury, a temperature of between +60°F and +95°F, and a relative humidity of not more than 90%. Where tests are performed with atmospheric conditions substantially different from the specified values, proper allowance for changes in instrument readings shall be made to compensate for the deviation from the specified conditions.

2.6 Sequence of Tests:

The sequence of tests shall be as called out in the body of this report.

2.0 SPECIAL INSTRUCTIONS: (Cont'd)

2.7 Tolerances:

The maximum allowable tolerances on test conditions during environmental testing shall be as follows:

a) Temperature - plus or minus 4°F

b) Barometric Pressure - plus or minus 5 percent

c) Relative Humidity - plus or minus 10 percent

d) Vibration Amplitude - plus or minus 10 percent

e) Vibration Frequency - plus or minus 2 percent

f) Shock - plus or minus 10 percent

g) Acceleration - plus or minus 10 percent

2.8 Measurements:

All measurements shall be made with instruments whose accuracies have been certified by the Astronautics Standards Laboratory, and which bear a current calibration decal.

2.9 Temperature Stabilization:

Temperature stabilization has been reached when the temperature of the largest centrally located mass of the unit does not vary more than 5°F from the temperature ambient to the unit.

3.0 TEST SPECIMEN:

3.1 Description of Test Specimen:

The Telepak Assembly Unit is a device which is capable of converting instrumentation measurement signals into suitable inputs for a telemeter transmitter, and then transmit these signals. This is accomplished through the use of appropriate electronic sub-assemblies which perform the following functions:

a) DC voltage signal conversion and measurement.

3.1 Description of Test Specimen: (Cont'd)

b) Alternating current amplitude, and phase measurement.

c) Transducer and measurement circuitry excitation.

d) Temperature measurement

e) Filter, limit and multiplex frequency measurements.

f) Low level voltage amplification.

g) Monitor ten "on-off" functions for single channel telemetry.

3.2 Operating Requirements and Tolerances:

PARAMETER	NOMINAL VALUE	TOLERANCE
Transducer Power Supply		
Input Voltage	+27.5 Volts DC	±10%
Output Voltage	-1.24 Volts DC, at 1 ma	±0.03 V.
Output Voltage	-6.0 Volts DC, at 5 ma	±1%
Output Voltage	+2.5 Volts DC, at 0.05 ma	±0.006 V.
Output Voltage	+5.0 Volts DC, at 0.05 ma	±0.02%
Output Voltage	+5.1 Volts DC, at 100 ma	±0.1 V.
Output Voltage	+5.2 Volts DC, at 50 ma	±0.1 V.
Output Voltage	4.5v to 8.6v DC at 50 ma	±0.25 V
Output Voltage	+8.8 Volts DC, at 300 ma	0.2 V

3.2 Operating Requirements and Tolerances: (Cont'd)

PARAMETER	NOMINAL VALUE	TOLERANCE
Commutator Power Supply		
Input Voltage	+27.5 Volts DC	±10%
Output Voltage	115 Volts AC	±15%
Output Frequency	400 CPS	±5%
Output Load	0.6 P.F.	
Commutators		
Input Voltage	115 Volts AC, 400 CPS	±15%
Crystal Rectifier		
Section A		
Input Voltage	+20 to +35 Volts DC	± 1%
Output Voltage	±150 mv to +5 Volts DC	± 3%
Section B		
Input Voltage	105 to 125 Volts AC, 400 CPS - Phase A	±1.75%
Output Voltage	250 mv to +5 Volts DC	±5%
Section C		
Input Voltage	105 to 125 Volts AC, 400 CPS - Phase B	±1.75%
Output Voltage	±250 mv to +5 Volts DC	±5%
Section D		
Input Voltage	105 to 125 Volts AC, 400 CPS - Phase C	±1.75%
Output Voltage	±250 mv to +5 Volts DC	±5%

3.2 Operating Requirements and Tolerances: (Cont'd)

PARAMETER	NOMINAL VALUE	TOLERANCE
Differential Amplifiers		
Section A		
Input Voltage	0 to +100 mv DC	±2%
Output Voltage	0 to +5 Volts DC	±2%
Section B		
Input Voltage	0 to 100 mv DC	±2%
Output Voltage	0 to +5 Volts DC	±2%
Demodulators		
Input Voltage	0 - 0.125 Volts AC, 400 CPS	±1%
Output Voltage	±40 mv to 5 Volts DC	±2%
Filter Assembly - Limiter		
Channel 1		
Input Voltage	115 Volts AC 400 CPS, Phase A	±1%
Output Load	160 K Ohms	
Output Voltage	0.096 Volts AC	±4%
Output Frequency	400 CPS	±30 Cycles
Channel 4		
Input Voltage	As in Figure 1	±1%
Output Load	160 K Ohms	
Output Voltage	0.096 Volts AC	±4%
Output Frequency	5400 CPS	±405 Cycles

3.2 Operating Requirements and Tolerances: (Cont'd)

PARAMETER	NOMINAL VALUE	TOLERANCE
Function Tone Generator		
Channel 1		
Input Voltage	+27.5 Volts DC	±10%
Output Voltage	0.079 Volts AC	±10%
Output Frequency	33 CPS	±5 CPS
Channel 2		
Input Voltage	+27.5 Volts DC	±10%
Output Voltage	0.079 Volts AC	±10%
Output Frequency	74 CPS	±5 CPS
Channel 3		
Input Voltage	+27.5 Volts DC	±10%
Output Voltage	0.128 Volts AC	±10%
Output Frequency	115 CPS	±5 CPS
Channel 4		
Input Voltage	+27.5 Volts DC	±10%
Output Voltage	0.171 Volts AC	±10%
Output Frequency	156 CPS	±5 CPS
Channel 5		
Input Volts	+27.5 Volts DC	±10%
Output Voltage	0.220 Volts AC	±10%
Output Frequency	197 CPS	±5 CPS

3.2 Operating Requirements and Tolerances: (Cont'd)

PARAMETER	NOMINAL VALUE	TOLERANCE
Channel 6		
Input Voltage	+27.5 Volts DC	±10%
Output Voltage	0.272 Volts AC	±10%
Output Frequency	238 CPS	±5 CPS
Channel 7		
Input Voltage	+27.5 Volts DC	±10%
Output Voltage	0.321 Volts AC	±10%
Output Frequency	279 CPS	±5 CPS
Channel 8		
Input Voltage	+27.5 Volts DC	±10%
Output Voltage	0.357 Volts AC	±10%
Output Frequency	320 CPS	±5 CPS
Channel 9		
Input Voltage	+27.5 Volts DC	±10%
Output Voltage	0.410 Volts AC	±10%
Output Frequency	361 CPS	±5 CPS
Channel 10		
Input Voltage	+27.5 Volts DC	±10%
Output Voltage	0.452 Volts AC	±10%
Output Frequency	402 CPS	±5 CPS

3.2 Operating Requirements and Tolerances: (Cont'd)

PARAMETER	NOMINAL VALUE	TOLERANCE
Circuit Board Assembly		
Limiter Section		
Input Voltage	-1.25 to +5.0 Volts DC	±1%
Output Voltage	Shall vary linearly with input from -1.25 volts to 5.0 volts ±0.1 volt. For input below -1.8 volts or above 6.0 volts, the output shall not vary more than -0.1 volt or +0.2 volt from the limits of -1.8 volts or 6.0 volts DC	
Blip Section		
Input Voltage	+27.5 Volts DC	±10%
Output Voltage	+5.25 Volts DC, Decaying exponentially to zero	±2%
Divider Section		
Input Voltage	-1.25 Volts DC	±3%
Output Voltage	-1.0 Volts DC	Minimum
Output Load	1 meg ohm	Minimum
Temperature Board		
Input Resistance	Proper value to simulate appropriate transducer	
Output Voltage	0 to +100 mv	±2%

3.2 Operating Requirements and Tolerances: (Cont'd)

PARAMETER	NOMINAL VALUE	TOLERANCE
Power Changeover Switch and Command Relays		
Input Voltage	+27.5 Volts DC	±10%

4.0 TEST FACILITIES AND TEST EQUIPMENT:

4.1 Environmental Test Equipment:

4.1.1 Vibration Equipment

MB Model C-25H vibration system, or equivalent, together with suitable monitoring and recording equipment.

4.1.2 Temperature - Altitude - Humidity Equipment:

BEMCO Environmental Chamber, Model WFA-100-45, or equivalent.

4.1.3 Acceleration Test Equipment:

Genisco Rotary Accelerator, Model C-159, or equivalent.

4.2 Initial Satisfactory Performance Test Equipment:

The following test equipment or equivalent shall be used.

a. Digital Voltmeter, Electro Instruments, Model 41R.

b. DC Power Supply, Hewlett Packard, Model 712B

c. DC Power Supply, Magnetic Research Corporation, Model MR-28-5.

d. AC Power Supply, Behlman Engineering Corporation, Model 253C-1.

e. Recorder, Sanborn Company, Model 150

f. Recorder, Midwestern Instruments, Model 591

g. Oscilloscope, Tektronic Inc., Model 315R

h. Wave Analyser, Hewlett Packard, Model 302-A

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4.3 Proof Cycle Test Equipment

a. Same as in paragraph 4.2

5.0 TEST CONDITIONS AND PROCEDURES:

5.1 Preliminary Inspection:

The test specimen shall be examined visually prior to any test to determine that the specimen meets the requirements of workmanship, identification markings, external dimensions, and proper inspection approval.

5.2 Initial Satisfactory Performance Test:

The initial satisfactory performance test (ISPT) shall be performed prior to any environmental tests. If the specimen fails any test, for any reason, and must be adjusted or repaired, an initial satisfactory performance test shall be performed before testing is resumed.

5.2.1 Preparation for Testing:

5.2.1.1 Connect the test specimen with the correct power sources and associated test equipment.

5.2.1.2 Turn on test equipment power switches and allow 20 minutes warm up time.

5.2.1.3 Turn on power switches to test specimen.

5.2.2 Transducer Power Supply

5.2.2.1 Monitor output voltages, and output noise voltage with input voltages of +24.75, +27.5 and +30.25 volts DC.

5.2.3 Crystal Rectifier

5.2.3.1 Section A

Monitor output voltage and output noise voltage as input is varied from +20 to +35 volts DC, ±1%, in 5 volts increments.

5.2.3 Crystal Rectifier (Cont'd)

5.2.3.2 Section B

Monitor output voltage and output noise voltage as input voltage is varied from 105 to 125 volts AC, ±1%, in 5 volts increments.

5.2.3.3 Section C

Same as paragraph 5.2.3.2

5.2.3.4 Section D

Same as paragraph 5.2.3.2

5.2.4 Rate Demodulator

5.2.4.1 Monitor output voltage, and output noise voltage as input varies from 0 to 0.125 volts AC, ±1%, in 5 steps. Input is in phase with 115 voltAC reference voltage applied to demodulator.

5.2.4.2 Repeat 5.2.4.1, except input is 180° out of phase with reference voltage.

5.2.5 Differential Amplifiers

5.2.5.1 Section A

Monitor output voltage, and output noise voltage as input voltage varies from 0 to +100 mv DC.

5.2.5.2 Section B

Same as paragraph 5.2.5.1

5.2.6 Temperature Bridges

5.2.6.1 Complete each temperature bridge with a resistance that will simulate an appropriate transducer.

5.2.6.2 Monitor output voltage.

5.2.7 Limiter - Blip Board

5.2.7.1 Blip Circuit

Monitor output voltage with an input voltage pulse of +27.5 volts DC, ±10%.

5.2.7.2 Limiter Section

Monitor output voltage as input voltage varies from -3 to +7 volts, ±1%, in 2 volt increments.

5.2.7.3 Divider Circuit

Monitor output voltage.

5.2.8 Function Tone Generator

5.2.8.1 Turn on each tone oscillator, one at a time, and monitor; output voltage, and output frequency.

5.2.8.2 Turn on all tone oscillators and monitor output voltage of each oscillator.

5.2.9 Commutator Power Supply

5.2.9.1 Monitor output voltage with input voltages of +24.75, +27.5 and +30.25 volts DC.

5.2.10 Power Changeover and Command Relays:

5.2.10.1 Energize each of the relays with +27.5 volts DC and then de-energize. Monitor TIM output and commutator wiper.

5.2.11 Filter Assembly - Limiter:

5.2.11.1 Monitor output voltage with an input of 115 volts AC, 400 CPS, and with an input as in Figure 1.

5.3 Proof Cycle Test:

The proof cycle test for this unit consists of the following sequence of operation.

5.3 Proof Cycle Test: (Cont'd)

5.3.1 Preparation for Testing:

5.3.1.1 Connect the test specimen with the correct power sources and associated test equipment.

5.3.1.2 Turn on test equipment power switches and allow 20 minutes warm up time.

5.3.1.3 Turn on power switches to test specimen.

5.3.2 Testing:

5.3.2.1 Adjust all input voltages within the limits called out in Section 3.2.

5.3.2.2 Monitor output voltages and output noise voltages of every module within the system to determine compliance with Section 3.2.

5.4 Vibration Test:

The test specimen shall be jusbjected to a proof cycle, as called out in Section 5.3, after each vibration test.

5.4.1 Sinusoidal Vibration

While operating, the unit shall be subjected to a slow speed scanning sweep, at frequencies and amplitudes of sinusoidal vibration as shown in Figure 2, and a sweep period as shown in Figure 3 along each of any three mutually perpendicular axes of the test specimen.

5.5 Temperature-Altitude- Humidity Tests:

The following test sequence shall be conducted in a temperature-altitude-humidity test chamber in the order specified. A thermo couple shall be placed with good

5.5 Temperature-Altitude-Humidity Tests: (Cont'd)

thermal contact on the largest centrally located internal mass within the unit, or in any other location deemed necessary to check temperature stabilization.

a. The unit shall be placed within the chamber and the specimen temperature shall be stabilized and maintained at plus 125°F for a period of one hour. The chamber temperature shall be maintained and the specimen shall be subjected to radiant heat at the rate of 360/BTU/sq./ft./hr. upon its largest surface area for a period of four hours. The maximum unit temperature during this period shall be determined and where indicated in the following tests by the term "maximum non-operating temperature", used in conducting tests.

b. The chamber temperature shall be reduced to -30°F, at a rate of 0.75 to 1.25°F per minute, and maintained at this temperature for a period of not less than eight hours, or until unit temperature stabilizes, whichever is longer. During or at the end of the period, the chamber absolute internal pressure shall be reduced to 3.44 inches of mercury for a period of at least one hour and then returned to approximately thirty inches of mercury. The test specimen shall then be operated through one proof cycle while supplied with sufficient cooling or heating air to maintain the test specimen skin temperature at 0°F, and a record made of all data necessary to determine compliance with the proof cycle requirements of this procedure.

c. The chamber temperature shall be increased at a rate of 0.75 to 1.25°F per minute to maximum nonoperating temperature, or 160°F, whichever is greater, and maintained with a relative humidity of not less than 95 percent, for a period of four hours, or until test specimen temperature stabilizes, whichever is longer. At the end of this period the chamber internal absolute pressure shall be reduced to 3.44 inches of mercury for a period of at least one hour, and then returned to approximately thirty inches of mercury.

5.5 Temperature-Altitude-Humidity Tests: (Cont'd)

c. (Cont'd)
During this period of one hour, relative humidity may be decreased, but shall be returned to 95 percent at a pressure of thirty inches of mercury. The chamber shall then be allowed to return to ambient temperature until the test specimen temperature stabilizes. The test specimen shall be operated through one proof cycle while supplied with sufficient heating or cooling air to maintain the test specimen skin temperature at 110°F, and a record made of all data necessary to determine compliance with the proof cycle requirements of this report. Immediately following, the test specimen shall be operated while the chamber internal absolute pressure is reduced to not more than 0.1 micron of mercury as rapidly as possible (no humidity control), and a record made of all data necessary to determine compliance with the proof cycle requirements of this report.

d. The chamber absolute pressure shall be returned to 30 inches of mercury and the chamber temperature shall be returned to plus 40°F at a rate of 0.75 to 1.25°F per minute, and a relative humidity of not less than 95 percent, and maintained for a period of not less than 4 hours, or until the unit temperature stabilizes, whichever is longer. At the end of this time, the unit shall be operated, and a record made of all data necessary to determine compliance with the proof cycle requirements of this procedure.

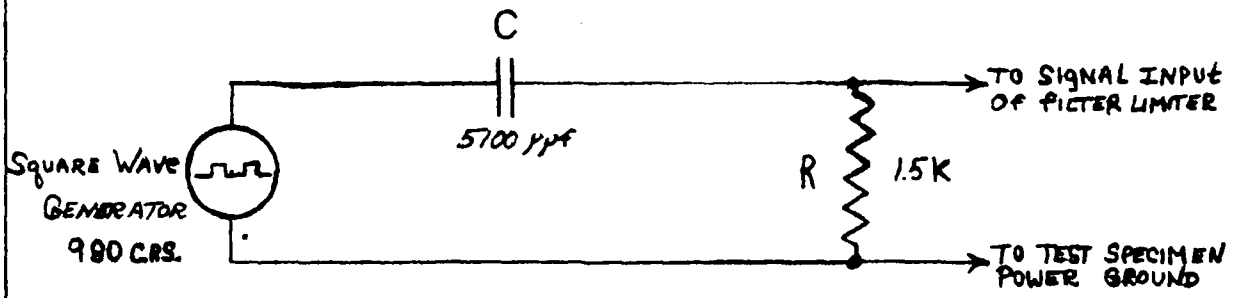
e. The unit shall be placed within the chamber and the chamber maintained at a temperature of 70°F for a period of at least one hour, or until the unit temperature stabilizes. The unit shall then, within a period of 2 minutes, be placed in a chamber whose temperature is at maximum non-operating temperature, or 160°F, whichever is greater, and maintained at this temperature for a period of one hour, or until temperature stabilizes. The unit shall then, within a period of 2 minutes, be placed in a chamber whose temperature is minus 30°F, and maintained at this temperature until the unit temperature stabilizes. The unit shall then be returned to room ambient conditions and examined for evidence of deterioration, and operated to determine compliance with the proof cycle requirements of this procedure.

5.6 **Acceleration Test:**

The test specimen shall be subjected to the following tests while operating. A record shall be made of all data necessary to determine compliance with the proof cycle requirements of this procedure prior to and immediately following completion of this test.

a. The unit shall be subjected to 10.0g for a period of at least 30 seconds, along each of three mutually perpendicular axes of the unit.

FILTER LIMITER — INPUT SIGNAL



APPLICATION OF A SQUARE WAVE TO THE RC DIFFERENTIATING CIRCUIT WILL RESULT IN A SPIKED WAVEFORM ACROSS THE 1.5 K RESISTOR AS BELOW.

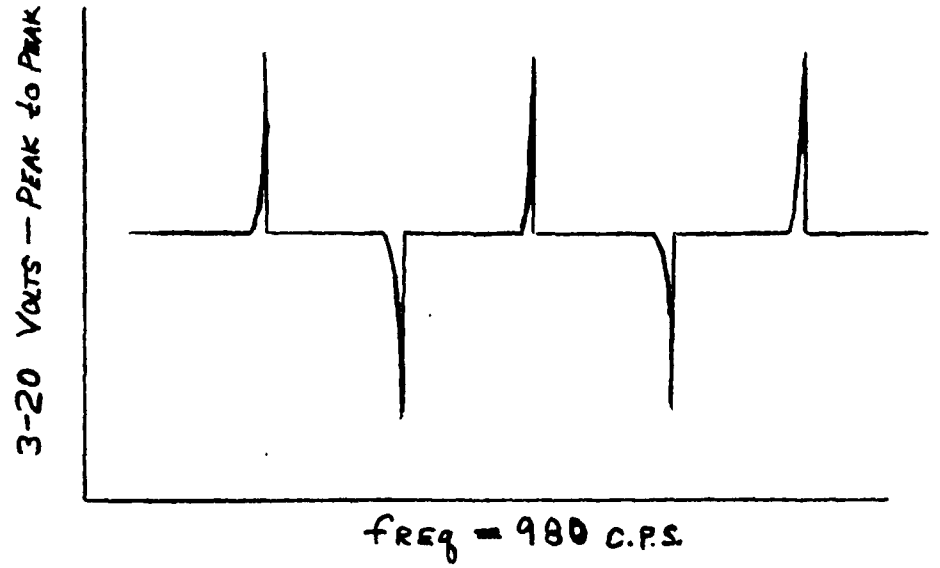


Figure 1

RHT 9-13-60

PREPARED BY	DATE	CHECKED BY	DATE	REVISED BY	DATE
R.H. Traester					

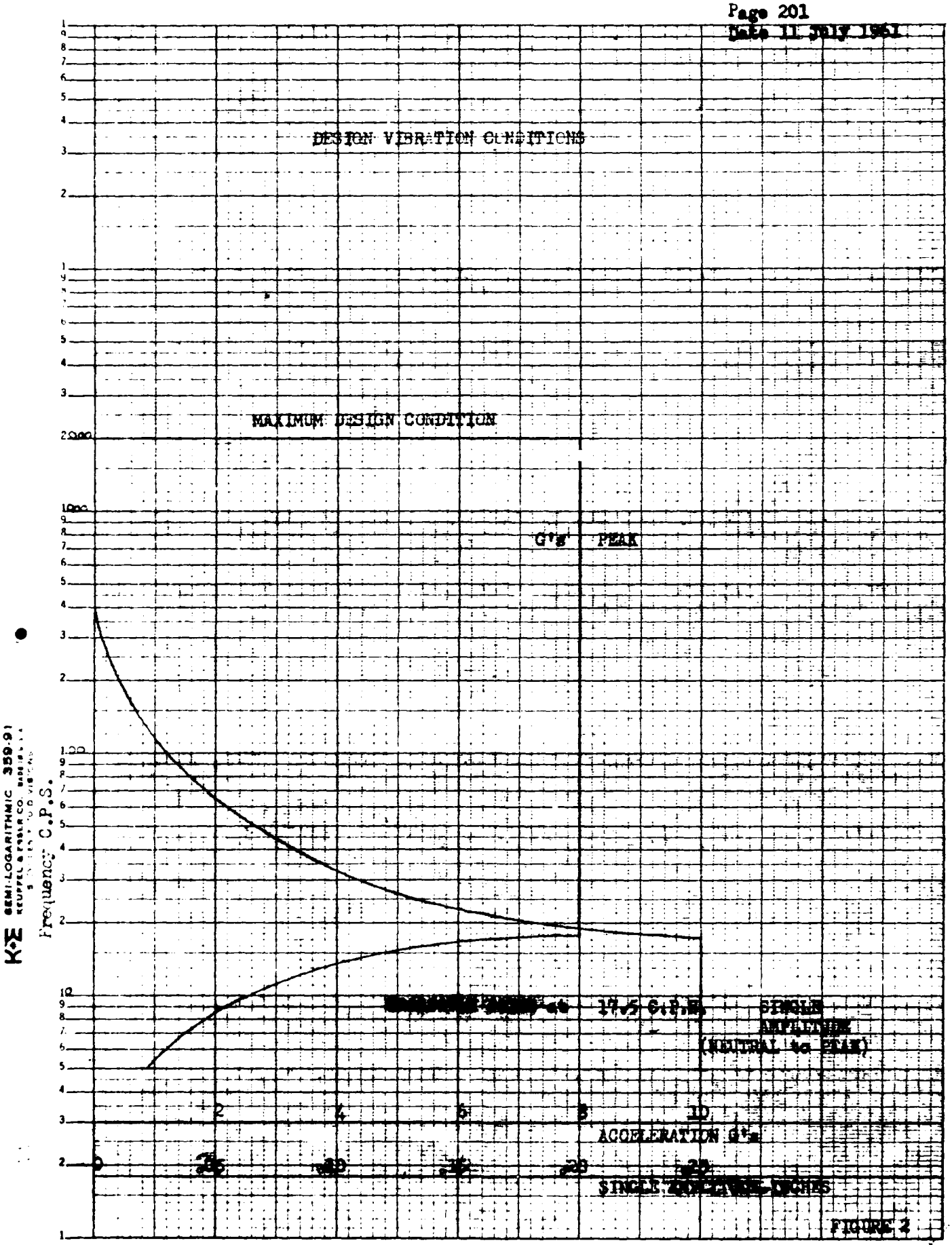

DESIGN VIBRATION CONDITIONS
MAXIMUM DESIGN CONDITION
G'g' PEAK
SINGLE AMPLITUDE (NEUTRAL to PEAK)
ACCELERATION G's
SINGLE AMPLITUDE INCHES
Frequency C.P.S.
KE SEMI-LOGARITHMIC 359-91

FIGURE 2

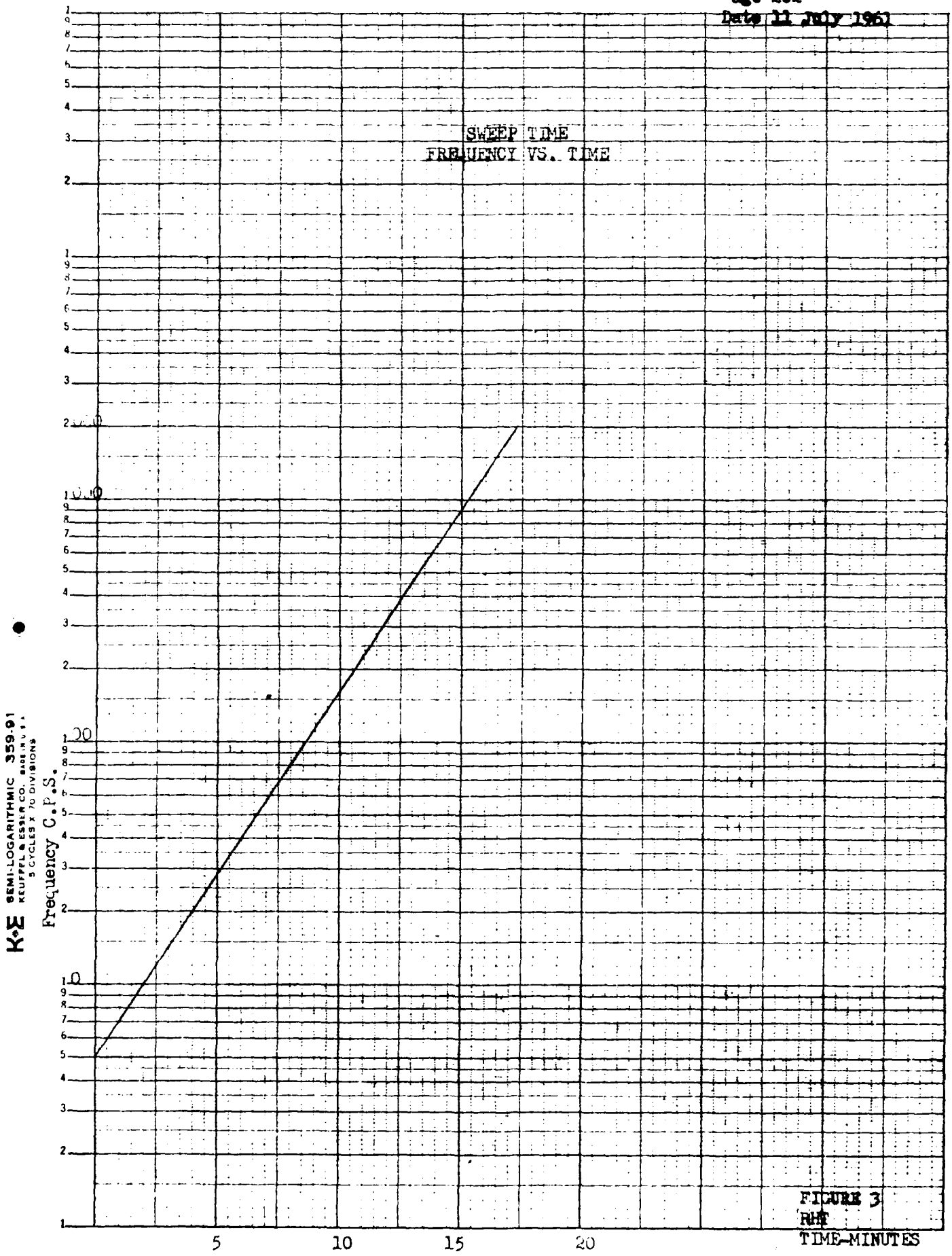

SWEEP TIME
FREQUENCY VS. TIME
Frequency C.P.S.
TIME-MINUTES
5
10
15
20
100
200
K&E SEMI-LOGARITHMIC 359-91
KEUFFEL & ESSER CO.
5 CYCLES X 70 DIVISIONS

FIGURE 3
RHT